

## THE CLAIMS

What is claimed is:

1. A golf ball comprising:
  - 5 a center comprising a resilient polymer comprising:
    - a rubber material having a molecular weight of greater than about 200,000,  
wherein the rubber material has a resilience index of at least about 40, and  
wherein the resilience index of the rubber material is calculated using the  
10 formula:  
$$\text{Resilience Index} = 100,000 * [(\text{Tan } \delta \text{ at } 10 \text{ cpm}) - (\text{Tan } \delta \text{ at } 1000 \text{ cpm})] / 990;$$
    - a crosslinking material present in an amount of about 10 to about 40 parts per  
hundred of the resilient polymer;
    - a free radical source present in an amount of about 0.1 to about 15 parts per  
hundred of the resilient polymer;
    - 15 a cis-to-trans catalyst present in an amount of about 0.1 to about 10 parts per  
hundred of the resilient polymer; and
    - a cover comprising a thermoplastic or thermoset polyurethane.
2. The golf ball of claim 1, wherein the resilience index is greater than about 50.
- 20 3. The golf ball of claim 1, wherein the rubber material comprises polybutadiene.
4. The golf ball of claim 2, wherein the molecular weight of the polybutadiene is from  
about 300,000 to about 500,000.
- 25 5. The golf ball of claim 2, wherein the polybutadiene comprises less than about 7  
percent vinyl isomer.
6. The golf ball of claim 5, wherein the polybutadiene comprises less than about 4  
30 percent vinyl isomer.
7. The golf ball of claim 1, wherein the center has an outer diameter of about 1.55 inches  
or greater.

8. The golf ball of claim 1, wherein the cover has a thickness of about 0.05 inches or less.

9. The golf ball of claim 1, further comprising an intermediate layer disposed between the center and the cover.

10. The golf ball of claim 9, wherein the intermediate layer has an outer diameter of about 1.58 inches or greater.

11. A golf ball comprising:

a center comprising a resilient polymer, wherein the resilient polymer comprises:  
polybutadiene having a molecular weight of about 300,000 to about 500,000  
and a resilience index of about 40, wherein the resilience index is  
calculated using the formula:

$$\text{Resilience Index} = 100,000 * [(\text{Tan } \delta \text{ at } 10 \text{ cpm}) - (\text{Tan } \delta \text{ at } 1000 \text{ cpm})] / 990;$$

a crosslinking material present in an amount of about 10 to about 40 parts per hundred of the resilient polymer;

a free radical source present in an amount of about 0.1 to about 15 parts per hundred of the resilient polymer;

a cis-to-trans catalyst present in an amount of about 0.1 to about 10 parts per hundred of the resilient polymer; and

a cover formed of a castable reactive liquid material.

12. The golf ball of claim 11, wherein the cis-to-trans catalyst comprises an organosulfur compound, an aromatic organic compound, or a combination thereof.

13. The golf ball of claim 12, wherein the aromatic organic compound comprises a hydroxy group, a metal salt of a hydroxyl, or a combination thereof.

14. The golf ball of claim 12, wherein the aromatic organic compound comprises a mercapto group, a metal salt of a mercapto group, or a combination thereof.

15. The golf ball of claim 12, wherein the organosulfur compound comprises metal.

16. The golf ball of claim 12, wherein the organosulfur compound is substantially free of metal.

17. A golf ball comprising:

a center comprising a resilient polymer, wherein the resilient polymer comprises:  
a rubber material having a molecular weight of greater than about 200,000 and  
a resilience index of about 50, wherein the resilience index is calculated  
using the equation:  
$$\text{Resilience Index} = 100,000 * [(\text{Tan } \delta \text{ at } 10 \text{ cpm}) - (\text{Tan } \delta \text{ at } 1000 \text{ cpm})] / 990;$$
  
a crosslinking material present in an amount of about 10 to about 40 parts per  
hundred of the resilient polymer;  
a free radical source present in an amount of about 0.1 to about 15 parts per  
hundred of the resilient polymer;  
a cis-to-trans catalyst present in an amount sufficient to produce a resilient  
polymer comprising about 12 percent or greater trans-isomer; and  
a cover formed of a thermoset or thermoplastic polyurethane, wherein the cover  
has a hardness of about 30 Shore D to about 60 Shore D.

18. The golf ball of claim 17, wherein the rubber material comprises polybutadiene.

19. The golf ball of claim 17, wherein the polybutadiene comprises less than about 4 percent vinyl-isomer.

20. The golf ball of claim 17, wherein the resilient polymer comprises less than about 7 percent vinyl-isomer.

21. The golf ball of claim 17, wherein the cis-to-trans catalyst is present in an amount sufficient to produce resilient polymer comprising about 32 percent or greater trans-isomer.